FAA Aviation NEWS

November-December 1988

A DOT/FAA FLIGHT STANDARDS SAFETY PUBLICATION

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**Federal Aviation
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BRIEFS

STICKY VALVES. An increase in FAA Service Difficulty reports concerning valve sticking problems with Lycoming reciprocating engines has been reported, resulting in at least 36 unscheduled landings in the past several years. The problem appears to be associated with the use of 100LL octane fuel used in low compression engines designed for 80/87 octane fuel, which is unavailable at many airports.

Preventative maintenance should include changing the oil and filter every 25 hours; or usage of a full flow oil filter--which may be changed every 50 hours. See Lycoming service Letter No. L-197 and Service Instruction No. 1425 for information on how to recognize the onset of valve sticking by changes in engine operation.

IN THE DARK. Night flying time as related to the PIC recency of experience requirements of Part 61.57(d) is defined as the period beginning one hour after sunset and ending one hour before sunrise--not after sunrise, as indicated in a misprint in the Sept/Oct FORUM.

NORTH BY LORAN. A survey of LORAN-C usage by Canadian pilots has disclosed that more than two thirds of the northern airmen use this equipment as a primary backup in obtaining position in VFR navigation. About 30 percent of the Canadian VFR pilots queried said they commonly use LORAN-C as a backup system. Comments on system accuracy were favorable.

However, signal deterioration was noted on occasion in the central provinces (north of the U.S. Mid-continental Gap), particularly on the eastern slopes of the Rocky Mountain and in a few localized mountainous areas.

AIRWORTHINESS DIRECTIVES are sent out free to registered owners of aircraft, whose name appears on the aircraft registration form in the aircraft. In many cases the legal owner is a bank, a leading company, or a corporation headquarters. If that is true of your aircraft, you should establish some means of having the AD's forwarded to you--your safety as well as your liability for accidents could be at risk.

For further information contact the FAA Aeronautical Center, AVN-113, P.O. Box 26460, Oklahoma City, OK 73125. Telephone 405-681-4374.

Calculating Your Crosswind Landing

Execute the Landing not the Aircraft

Did you ever hold at the end of a runway and watch crosswind landings being executed? Some airplanes feel for the ground with one wheel, others have twice the drift correction needed, and almost all have much more speed than necessary. You might notice that for some pilots, "executed" was the right description, considering the number of aircraft rendered non-airworthy by poor techniques. Just this month we reported an airplane trying to get its right wheel on the ground in a right crosswind while keeping straight with left rudder. The right wheel finally touched down, followed by the nose wheel. The airplane then shot off to the left across the runway and became mired in the soft turf. It was not a good day.

When discussing crosswind landings, you might also notice that pilot's emotion can be directly proportional to his knowledge of the subject; the less he knows, the more emotion. Actually there is no single approved technique. That depends on the pilot, the airplane, and the conditions; you can hold a wing down, crab, or combine the two, Federal Aviation Regulations 23 and 25 prescribe airworthiness standards that may help develop the most comfortable method for each of us. Remember the objective is a safe landing, not whose method is best.

Design requirements generally consider that landings start back at about 50 feet altitude and at a speed of 1.3 times the stalling speed of the airplane in the landing configuration. Altitude and speed are reduced while retaining full control of the airplane. You can put the airplane on the ground at a speed greater than stalling speed; however, control and stopping problems are multiplied.

Be it a two-place trainer or a four-engine jet, regulations require that there be no uncontrollable ground looping tendencies in 90-degree crosswind up to a velocity of 0.2 times the stalling speed of the airplane in its landing configuration, and the landing shall not require exceptional piloting skill. So, if your airplane stalls at 60 knots, it must be safely controllable in a direct 12-knot crosswind. A faster airplane which stalls at 104 knots has to be proven safe in a 21-knot crosswind. Both of these airplanes will have an approximate 12-degree angle of drift.

Most airplane flight manuals will show that the airplane has been tested in crosswinds greater than 0.2 times the stalling speed but are rarely tested above 25-30 knots.

At 50 feet altitude with 1.3 times stall, suppose the stalling speed was given as 38 knots, then the approach speed would be about 50 knots. If an average light twin stalls at 61 knots, then the approach speed would be about 80 knots. The *JetStar* at a 35,000 lb. landing weight stalls at 104 knots, which indicates its approach would be made at about 135. A large airplane, the Boeing 707, at a landing weight of 275,000 pounds, will have about the same numbers as a *JetStar*.

Up to this point, the size of the airplane does not complicate the basics of a landing. A crosswind of 0.2 times stall will still require about 12 degrees of crab angle. These speeds can be found in either the approved flight manual, from the airspeed indicator, or from instrument panel placards.

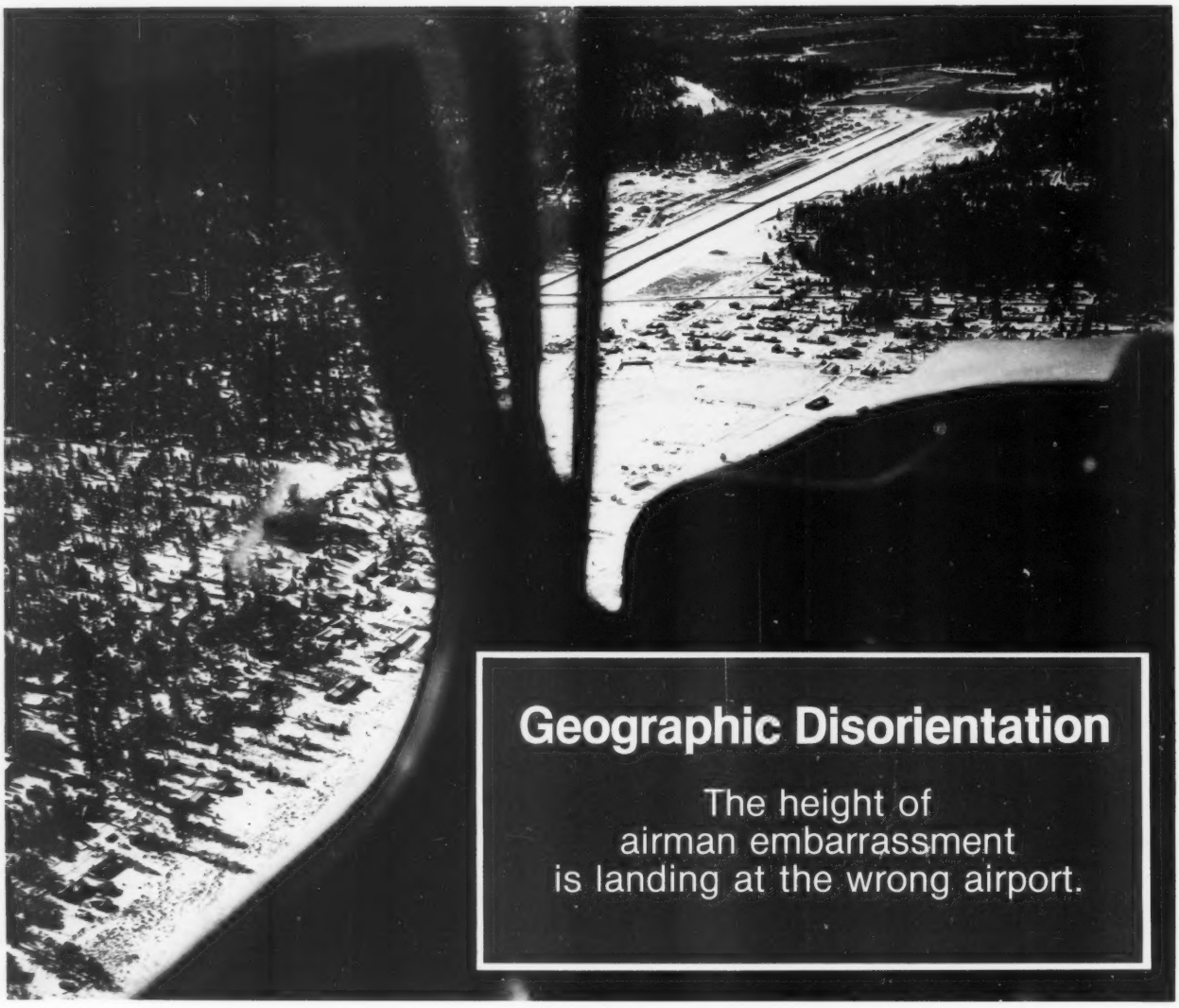
Occasionally there may be a need for additional approach speed during gusty wind conditions. A pretty accurate rule-of-thumb indicates that a 10-percent increase in touchdown speed requires approximately 21 percent additional stopping distance, so you have to be sure you have enough pavement. That an airspeed of 1.3 times stall equates to a 30-percent margin over stall, so if you think you need an excessive approach speed to handle turbulence and chop, let good judgment overrule pride and consider another airport which might have better wind conditions.

Opinions concerning this additional airspeed range from adding "one-half of the gust factor" to a "little extra for the wife and kiddies." More specific advice may be given in the flight manual! In giving over 7,500 flight checks, I have noticed that approach speeds tend to creep up uncomfortably. This happens during initial training and as confidence is obtained, speeds drop down but seem to level off a few knots higher than necessary. It is rare to see an approach that is too slow, it is a pleasure to see it right on target.

Give some thought to this idea of making a crosswind landing: line up with the runway and crab into the wind with the wings level. As speed is reduced at or near the touchdown point, PUSH the nose straight down the runway with the rudder. Keep the wings level, or nearly, with the ailerons. After the airplane has made a nice landing (surprised?), continue on the ground using the controls necessary to keep it straight and level down the center of the runway.

The key word is "push"; timing is not that critical. You can do it'. ■

The author of this article is John Doster, Manager of FAA's Allentown, PA District Office and a veteran of 40 years in aviation instruction.



Geographic Disorientation

The height of airman embarrassment is landing at the wrong airport.

On a fine summer evening a Boeing 737 airliner made a smooth landing on runway 12-30 at Johnson County Airport in central Wyoming. As the flight attendants prepared to offload the passengers for the city of Sheridan, a serious problem became apparent: Sheridan was almost 40 miles away.

The aircraft had put down prematurely at Buffalo, a small town of about 4,000 inhabitants which had never before witnessed the landing of a jet air carrier. To celebrate the event local citizens made the captain an honorary citizen of Buffalo. During the long bus-ride to Sheridan he was also made the butt of passenger complaints and humorous jibes. Later he had to answer the questions of an amused press corps and a not so-amused battery of company representatives and state and Federal officials.

How could he possibly have mistaken the airport at Buffalo for Sheridan?

There were some similarities. The runway alignment was approximately the same (although Sheridan has a small intersecting runway, and Buffalo does not). Both airports were located on the west side of the municipality (but the airport for Buffalo lay at the northwest end of town, while at Sheridan it was due west.) Both airports were on a plateau with high mountains to the west, but the elevation at Buffalo was almost 5,000 feet, compared with 4,100 feet at Sheridan). And so on. Similar, yes, but given the clear weather, excellent visibility and the professional crew, these airports should have been easily distinguishable from one another.

As a matter of fact, mistakes of this kind happen in aviation more frequently than most people imagine, according to "A study of Geographic Disorientation: Approach and Landing at the Wrong Airport," a report now being prepared for publication by three aviation medical doctors at Wright State (OH) University. The report analyzes 75 cases of airport mis-identification by air carrier crews over a 10 year period, 1982 through 1987; and 16 general aviation accidents that occurred over a three year period, 1983-1985, as a consequence of mistaking the destination airport.

The 75 air carrier cases cited were "incidents" rather than accidents in the sense that no one on board was injured and the aircraft sustained very slight damage or no damage at all. Data concerning these incidents was collected through the Aviation Safety Reporting System (ASRS), which is operated by the National Air and Space Administration, and provides such information to FAA while preserving anonymity for persons involved (except for criminal activities).

Surprisingly, the great majority (83%) of these 75 incidents took place under outright visual meteorological conditions. A few occurred under marginal VMC or in mixed VMC and IMC weather, but only one could be classified as completely IMC. Also notable: 58 incidents (77%) happened in broad daylight, while only 12 were at night and one at dusk. Obviously poor visibility could not be singled out as a predominant cause.

When the investigators from Wright State focussed their attention on psychological factors they concluded that a key behavior characteristic of all 75 pilots was a tendency "... to overtrust their sensory perceptions," and to fail to use information available from navigation instruments and charts to confirm the airport identification. Furthermore, the pilot's desire to land immediately appeared to override or blank out the pilot's ability to observe contradictory land features not associated with the assumed airport.

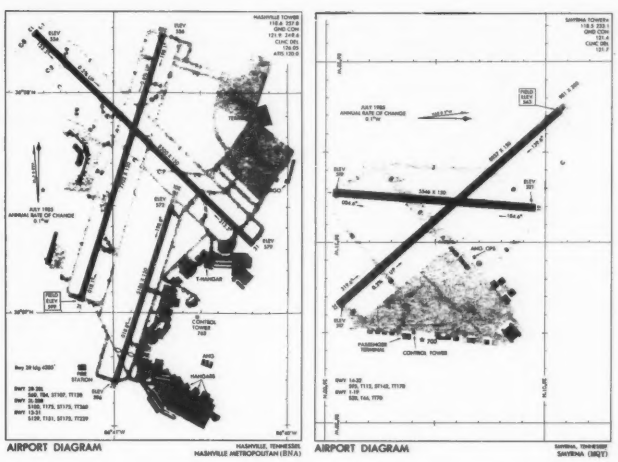
The investigators believe that even though this contradiction makes a physical impression upon the pilot—known as "cognitive dissonance"—this feeling is something he may not understand, and therefore disregards. Cognitive dissonance is a kind of mental disagreement about a conclusion one has come to, based on physical evidence; and it produces feelings of anxiety, tension or uneasiness. Any non-trivial decision made during the operation of an aircraft can produce a considerable amount of dissonance, but many pilots will not associate the uneasy feeling with a current decision. Consequently the action taken often has unpleasant consequences

For example, the pilot may approach an airport which in his mind is associated with a winding river. He sees the river and makes the identification, but then remembers the river as being on the opposite side of the airport. It is easier for him to decide that his memory was mistaken than to go over the appropriate chart or check the instrument readouts, call ATC, etc., so he continues the approach. The uneasiness he feels may be ascribed to being somewhat behind schedule or a poor selection at lunchtime.

Or, the pilot is informed by the local controller that the tower does not have him in sight. Rather than burden himself with this problem, the pilot may assume that the controller is simply not looking in the right sector. He repeats his position on the radio and commits himself to land, before realizing that the "control tower" he had observed near the far end of the runway was in fact a water tower, and that the radio transmissions were coming from another airport.

It is significant that all of the air carrier incidents reported began after the pilot has accepted or requested a visual approach. In some cases the pilots reported that controllers had urged them to accept the visual approach before they were able to establish a positive airport identification. (Pilots are under no obligation to accept a visual approach unless they are assured of accurate visual references.) In other incidents it appears that aircrews had requested the visual approach prematurely in order to avoid the time delay which continuing the instrument approach would have entailed.

There was an evident tendency for pilots to stop using NAVAIDs or charts once the airport was believed to be in sight, even when there was some uncertainty about terrain features, or an absence of visual contact with the tower. In several cases there appeared to be a dearth of aeronautical charts available in the cockpit, especially as regards sectional and area charts.



Airport diagrams of Nashville (l.) and Smyrna, TN as shown in approach plate.

TABLE I. AIRPORTS MIS-IDENTIFIED BY AIR CARRIER PILOTS 1982 TO 1987

INTENDED AIRPORT	WRONG AIRPORT
Albany County, NY	Schenectady, NY
Allen C. Thompson, Jackson, MS	Hawkins, Jackson, MS
Allen C. Thompson, Jackson, MS	Campbell County, TN*
Allentown-Bethlehem-Easton, PA	Queen City, PA
Bradley Airport, MA	Westover Air Force Base, MA
Blue Grass, Lexington, KY	Frankfort Capital City, KY
Buffalo International, NY	Niagara Falls International, NY
Bush Field, Augusta, GA	Daniel Field, Augusta, GA
Cedar Rapids Municipal, IA	Iowa City Municipal, IA
Columbus International, OH	Don Scott Airport, OH
Columbus Rickenbacker AFB, OH	Bolton Field, Columbus, OH
Columbia Regional, MO	Fulton Municipal, MO
Corpus Christi Intl., TX	Cabaniss Navy Field, TX
Dayton Cox International, OH	Wright Patterson AFB, OH
Deadhorse, Alaska	Prudhoe Bay, Alaska
El Paso International, TX	Biggs Air Force Base, TX
Farmington Municipal, NM	Aztec Municipal, NM*
Greenville Spartanburg, SC	Greenville Downtown, SC
Hobby Airport, Houston, TX	Ellington Air Force Base, TX*
Huntsville-Madison, AL	Redstone Army Air Field, AL
Indianapolis International, IN	Eagle Creek, Indianapolis, IN
Kearney Municipal, NE	Hall County, Grand Island, NE
Kileen Municipal, Austin, TX	Gray Army Air Field, TX
Los Angeles International, CA	Hawthorne Municipal, CA
Las Americas, FO	San Isidro Air Base, FO******
McChord, Seattle, WA	Gray Army Air Field, Seattle, WA
Memphis International, TN	Olive Branch Municipal, MS
Miami International, FL	Ft. Lauderdale International, FL
Miami International, FL	Opa Locka, Miami, FL
Mid-Continent, Wichita, KS	McConnel Air Force Base, KS
Muskegon County, Chicago, MI	Grand Haven Mem. Airpark, MI
Myrtle Beach Air Force Base, SC	North Myrtle Beach, SC
Nashville Metropolitan, TN	Smyrna Airport, TN******
Newark International, NJ	Linden Airport, NJ***
Oakland International, CA	Alameda Naval Air Station, CA
Ontario International, CA	Los Angeles International, CA
Port-Au-Prince, HAITI	Bowen Field (Military), HAITI
Providence, Green State, RI	Quonset State, RI
Rapid City Regional, SD	Ellsworth Air Force Base, SD
Redmond Roberts Field, OR	Prineville, OR
San Diego Intl. Lindbergh, CA	North Island, Naval Air Station, CA
San Juan Intl., PUERTO RICO	Isla Grande, PUERTO RICO*
Santa Ana, Orange County, CA	El Toro (Marine), Los Angeles, CA
Savannah Municipal, GA	Hunter Army Air Field, GA
Seattle-Tacoma International, WA	Boeing Field Seattle Intl., WA
Sheridan County, WY	Buffalo Municipal, WY
Standiford Field, Louisville, KY	Bowman Field, KY
Stewart Airport, Newburgh, NY	Dutchess County, NY*
Southwest Florida Regional, FL	Page Field, Ft. Myers, FL****
Tampa International, FL	McDill Air Force Base, FL
Will Rogers, Oklahoma City, OK	Wiley Post, Oklahoma City, OK

(*) The number of asterisks indicates the number of incidents reported.

GENERAL AVIATION MISTAKES

Reports of general aviation incidents of mistaken airport landings are relatively few, but it is unlikely that this is so because such mistakes are infrequent. Landing at the wrong airport is an embarrassing kind of error that no one likes to have acknowledged; the natural tendency is to turn the landing into a touch and go, if possible, or to fast-taxi back into position and initiate an immediate takeoff.

Air carriers cannot disappear so readily, as they are subject to many regulations and requirements once they touch down. Usually the passengers and baggage must be off-loaded, and the crew must report to ATC and to their company office. Calculations must be made as to whether there is a departure runway of sufficient length, width and load-bearing strength for the departure of the aircraft under present conditions (it may be necessary to remove seats and other weight-contribution materials); a departure clearance must be obtained and possibly a ferry crew dispatched to conduct the flight.

The general aviation landings at wrong airports studied by the Wright State team were all *accidents* reported by the National Transportation Safety Board. During a three year period, 1983 through 1985, there were 16 such accidents in non-commercial general aviation. All involved at least substantial damage to the aircraft. There were two deaths, two serious and five minor injuries.

According to the report, weather played no part in any of these mistaken landings. There were no obstructions to vision and no cloud ceilings. Visibility ranged from 6 to 45 miles. Windspeed averaged from 6 to 7 knots. Ten of the 16 mistaken landings were made in daylight, four at night, and two after dark. Primarily single-engine aircraft were involved.

All of the pilots, incidentally, were current in the aircraft. The youngest was 26, the oldest 60. Their flight experience varied from 89 to 12,000 hours.

The one fatal accident took place at night, on June 12, 1985, and involved a Bellanca *Super Viking* being flown from Saratoga Springs, N.Y. to Manassas Airport in northern Virginia, near Washington, D.C. There was no known flight plan. The pilot, with two passengers on board, arrived in the capitol area shortly after 9:00 p.m. and contacted Dulles Approach control for vectors to Manassas. He was cleared through existing traffic and then given a heading to the airport. The weather was VMC with scattered clouds at 25,000 feet and visibility seven miles.

According to the National Transportation Safety Board, the pilot proceeded to make a visual approach to Woodbridge Airport instead of Manassas. Manassas Airport, which was not attended after dusk, has two parallel runways, with lights which are activated at night by the pilot keying the mike. Woodbridge, located nine miles to the west, had a single runway, 01-19, which was illuminated with low intensity lights turned on by the airport.

One of the two passengers on the aircraft later told the National Transportation Safety Board that they circled the airport at a low altitude while the pilot was preoccupied with the runway lights (possibly trying to activate them to a higher intensity). At 10:06 p.m. the Bellanca crashed into trees near the end of the runway. The pilot and one passenger succumbed to injuries. The aircraft was destroyed.

This is a tragic example of pilot mis-anticipation—difficult to understand in view of the pilot's evident proficiency. He was a local resident, aged 49, with over 500 hours of flight time and current in the Bellanca. He was also instrument-rated. His most recent instructor described him to NTSB investigators as an "... extremely well-qualified pilot, intent on remaining proficient ... I have not known a more deliberate pilot."

But somehow the pilot confused the single runway airport at Woodbridge with the dual runway airport at Manassas, despite the 50° variance in orientation. It is possible that when he was given a heading for Manassas, the pilot's eye was attracted to the (continuously) lighted runway at Woodbridge, and he automatically associated the runway with his destination airport. From this point on apparently he was concerned only with landing on this illuminated runway, and not with verifying the airport identification.

The key to avoiding any tendency to make false assumptions of this kind is careful preflight planning—plus habitual crosschecking on the airport's identifiers before starting to land. This is especially important if you are landing after dark, in poor weather conditions or on unfamiliar terrain. It may be natural to be optimistic about a flight, but if you are not prepared for the worst possible scenario you are risking serious consequences.

If you are getting radar advisory service, once you are given a heading toward your intended landing field, it helps to ask for the approximate distance. If the airport is unattended or visibility is poor, the only positive indicator you may have that you are at the right airport is the distance and bearing from your last point of orientation. No matter how eager you are to land, crosscheck first.

Any urgent reason to land is apt to short circuit a pilot's perceptions. A desire to land before a passenger became sick to his stomach in the airplane led to a mistaken airport accident near Opa Locka, FL. During a daylight VFR flight from Marathon, FL to Jacksonville, the pilot of a Cessna *Skylane* observed that one of his three passengers had become airsick and appeared about to vomit. In his haste to get the airplane on the ground before this happened, the pilot mistook an ultralight strip for one of the runways at Opa Locka. During the landing on wet turf the landing gear sunk into the soft ground and the airplane nosed over. No injuries, but the repair bill considerably exceeded the price of a few airsick bags.

One of the least happy surprises a pilot can encounter is to discover, on close final or after touchdown, that the airport he has committed himself to is closed to operations, This is not actually a case of mis-identification but the consequences are similar: usually a difficult landing and perhaps an even more difficult departure Scrupulous use of current charts and airport directories will usually prevent these unhappy surprises, but it is also a good idea to check with the local flight service station for recent NOTAMs—particularly in the case of small or remotely located airports.

Failure to take this precaution led to an accident at Wauchula Airport in central Florida, involving a Piper *Cherokee*. The flight bound for Wauchula took place on October 4, 1984, at a time when the airport was in the midst of a change in ownership and temporarily closed to traffic. As a result the turf runway had become overgrown with long grass, which resulted in a sloppy landing and difficulty in braking. When the pilot attempted a hasty departure with full flaps, he was unable to rise out of ground effect in time to clear a line of trees in his flightpath. The takeoff was aborted, but not in time to prevent overrunning the field and nosing over in a ditch.

Aircraft parked on farmland sometimes act as a "decoy" to unwary pilots headed for a small private airstrip. The farmer may have a good smooth strip which he uses for his flight operations, but it is not necessarily the narrow roadway or cow trail near his tiedown area. Always use your radio to confirm the identity and accessibility of the runway. If there is no radio response, do not land at random; look for a windsock or other indicator of aviation use, and look out for livestock.

The common causal thread that runs through most general aviation wrong airport accidents is *failure of the pilot to crosscheck his references*, visual and otherwise. Good preparation and planning will provide you with the information you need for crosschecks, and good cockpit discipline will insure that you use what you know—before you start down.

Preparation. Flight navigation is rarely as simple as it seems when you draw a line on paper from a starting point to the end point. When you start out on a bright clear day it is natural to visualize yourself flying along under blue skies and homing in on your destination airport without a hitch. Often that is just the way it is, but sometimes it is not. Occasionally you will experience unexpected delays en route, perhaps of a mechanical nature. The sky may cloud over unexpectedly or crosswinds may materialize and push you off course. You may find yourself landing in pitch

The clearing near a parked airplane is not always the runway.

darkness. Or, given the present day expansion of housing developments in rural areas, the airport you are seeking may have been swallowed up by the bulldozer and the construction crane a few days earlier. Perhaps none of the above will ever happen to you but to fly cross country safely you have to be prepared for the unexpected. Two of the important items you want to check on during your preflight inspection are:

- Current aeronautical charts and airport directories.
- A flashlight in good working condition.

As everyone knows, in some areas sectional charts tend to be heavy with details; reading them in a small cockpit, perhaps in turbulence or fading light, is no easy matter. It helps to draw yourself a large-scale sketch displaying the terrain within 10 or 20 miles of your destination airport. Show the location and bearing of other airports and their runways. Indicate the kinds of runway lighting systems in use, and the appropriate CTAF (Common Traffic Advisory Frequency), as given in the current Airport Facility Directory.

Discipline. At the end of your flight understand—and resist—the temptation to identify your destination airport by means of the first visual impression. Check the geographical location, the runway orientations, your DME or timed distance from your last known position. How about the lighting system? Does the radio respondent actually have you in sight?

Finally do not overlook the warning signals of cognitive dissonance. If everything seems to tally, but you still have a queasy feeling in the pit of your stomach, consider the possibility that something is amiss, and recheck.

That little-understood "sixth sense" is worth cultivating. ■

Editor's Note: In preparing this article we were privileged to have access to recent studies on geographic disorientation conducted at the Wright State University School of Medicine by Melchor J. Antonano, M.D., John W. Gosbee, M.D. and Stanley R. Mohler, M.D.

For the convenience of our readers, we are providing an index of feature articles in the magazine from January 1986 through December 1988. Many articles are cross-referenced.

You may find bound copies of FAA GENERAL AVIATION NEWS and FAA AVIATION NEWS in most large public or university libraries. Filed copies are also available in some FAA District Offices. Unfortunately, back issues are no longer for sale, if local resources fail, write to us directly.

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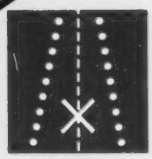

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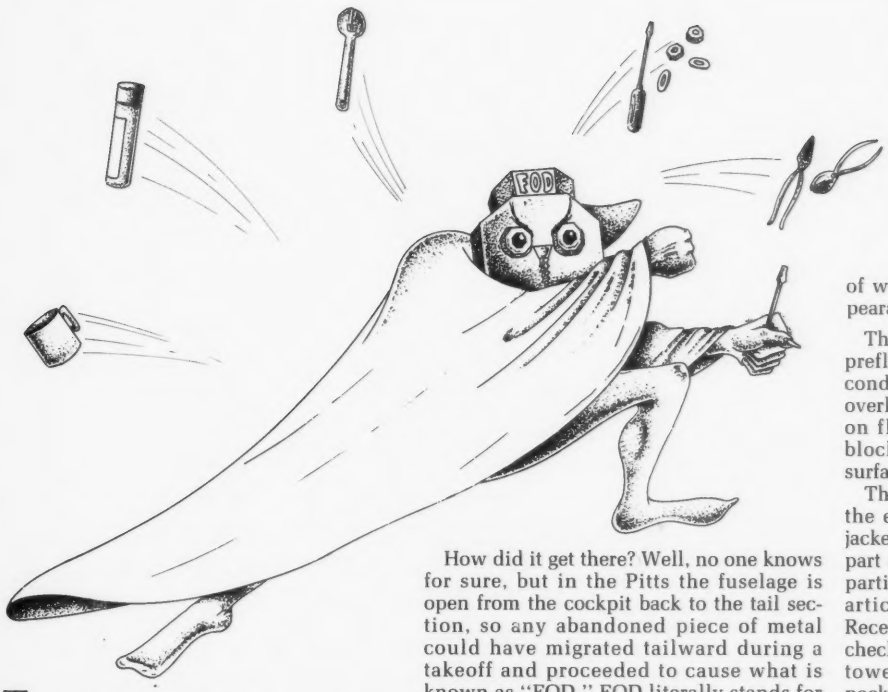
THE LAW OF FOD



The pilot of a Pitts *Special* recently carried out an aerobatic practice session that he is not likely to forget. After departing the airport he planned to fly to an altitude of 3,000 feet at the practice area. However, within five minutes of taking off he radioed the tower that he had lost control of his elevator, which appeared to be jammed in the pitch-down position. The aircraft was descending rapidly over a built-up section of town, despite his desperate efforts to pull the nose up.

Fortunately the pilot was well experienced in aerobatics and the Pitts powerplant was designed to operate continuously while inverted. Rolling the aircraft to the inverted position, the pilot was able to use elevator pitch-down to push the nose up and climb out of the area, However, landing the plane in this configuration was out of the question, and while he hated to lose the airplane, a bailout appeared inevitable.

However, the pilot was finally able to manipulate the stick free, whereupon he regained full control of the Pitts and landed safely at the airport. The aircraft was pulled into a hangar for inspection, which led to discovery of a loose bolt lying on the floor of the rear fuselage. Abrasion marks on the bolt indicated that it could have been jammed between the horizontal stabilizer rear spar tube and the front elevator spar tube, thereby jamming the elevator in a pitch-down position. The aircraft had recently undergone a periodic inspection, although no work was done involving that particular type of bolt, and no bolt could be found to be missing.

How did it get there? Well, no one knows for sure, but in the Pitts the fuselage is open from the cockpit back to the tail section, so any abandoned piece of metal could have migrated tailward during a takeoff and proceeded to cause what is known as "FOD." FOD literally stands for "foreign object damage," but it has also come to mean the object which causes the damage. It is virtually a magical word because there is no limit to the number and kinds of things it can stand for. Any aircraft part which somehow gets inserted where it does not belong can be a FOD. Also, any fitting, any nut, screw, bolt or nail. Any tool, instrument or gauge; any piece of string, wire or cable; an stray chart, booklet or binder; any lost pen, pencil or piece of chalk; any loose item of clothing, photography or baggage—anything at all that you can name, if it is not removed or fastened down will in time find a means of disabling an aircraft. This is the LAW of FOD.

The shape and size of most small aircraft make them ideal places for a potential FOD to slip out of sight or fade into the background. The prevention of FOD requires that every pilot, mechanic and handler of aircraft form an ironclad habit of putting everything in a secure place and getting rid of everything for which we have no place.

To begin with, anti-FOD surveillance should always be carried out before an aircraft is returned to service or readied for flight. The ideal time to spot a nesting mouse, wasp or any other free-housing seeker is when the engine and fuselage compartments are open for examination. Also, maintenance personnel can become unwitting perpetrators of a FOD attack if they fail to keep a strict accounting of tools and parts. The area around any disassembly job should be kept surgically clean—or as near to that ideal condition as possible—in the interests of preventing the insertion of wrong parts and the unnoticed disappearance of equipment.

The pilot who conducts his walk-around preflight with an eye only to the working condition of various components may be overlooking the more devious FOD assaults on flight safety, such as clogged vents, blocked air intakes, gustlocks on control surfaces, and forgotten items of clothing.

The latter may appear harmless, but once the engines are started up, hats, towels, jackets and the like become an indigestible part of the fuel air mixture. Helicopters in particular are notorious for snatching up articles that appear to be safely stored. Recently during a maintenance operation check on a CH-47 (military chopper) a shop towel was drawn out of a mechanic's pocket and sucked into the inlet of the No. 2 engine, causing extensive damage.

Incidentally, disposal of potential FODs around aircraft is not a matter to be taken lightly; the little devils may only be playing dead. The pilot of a UH-60 helicopter had just begun his runup when he heard a strange whistling noise. He looked out the window and saw that his rotor blade suction was emptying out a nearby trash can. This FOD receptacle had apparently been overfilled, which allowed the lid to come off when the engines were started. A discarded towel was found wrapped around the deicing harness on the main rotor, causing blade imbalance.

Taxiways and unpaved ground with high grass are favorite lurking areas for FOD agents. If you must use such terrain, taxi carefully and be attentive to low blows. Consider the experience of a pilot who was using a Champion 7HC (taildragger) for banner towing near Fort Lauderdale, FL. As he proceeded to taxi with the banner across an open field the pilot felt a sharp bump, which led him to reduce speed. However, he took off without checking for damage, only to discover as he became airborne that he had no aileron control whatever.

Attempting to set the airplane down he was unable to avoid collision with a taxiing Cessna 152, whose occupants narrowly escaped injury. The NTSB investigation disclosed that a rock had penetrated the fabric fuselage bottom of the Champion and fractured a bellcrank, which connected the ailerons to the control stick.

(continued on back cover)

Supplemental Oxygen Burns

"I am concerned about your response to a FORUM question (May/June 1988: 'Chapped Lips and Oxygen') as to whether there is danger of fire occurring where a pilot who has applied anti-chapping ointment to his lips goes on supplemental oxygen. Your reply in the negative is contradicted by many known incidents, as well as published articles on the subject."

Concerned Reader

Stories of airmen suffering burns as a consequence of inhaling supplemental oxygen in the presence of lip salve, moustache wax or other hair preparations are legion. However, the absence of documented evidence of such incidents or accidents, plus the results of controlled experimentation, has led investigators to conclude that such incidents or accidents must have been triggered by other factors, such as air pressure in excess of sea level, or unreported ignition sources (cigarettes, for example).

Oxygen, of course, does not burn, but it supports the flammability of various combustible materials. There is no question, that under certain conditions of elevated temperatures and/or pressure and sparking, the presence of oxygen will greatly increase the flammability of many petroleum products as well as alcohol and other fuels. Industrially used oxygen, for reasons of space economy, is commonly contained in high pressure tanks at several times one atmosphere. Leakage in the presence of not only fuel or oil but virtually any inflammable substance, combined with static discharge or electric motor sparking, could result in a disastrous fire.

However, in normal aviation use a regulator is used to deliver supplemental oxygen at ambient pressure (one atmosphere pressure or less.) According to the experiments carried out by CAMI, this virtually rules out the possibility of a facial burn from supplemental oxygen inhaled in the present of common facial and hair preparations. Testing for CAMI research involved four categories:

I. Spontaneous Ignition

A dozen common skin and hair preparations plus a standard motor oil were tested in a special chamber where they were exposed to 100% oxygen at a pressure of one atmosphere for periods up to three hours and at temperatures between 94°F and 112°F.

None of the compounds ignited spontaneously.

II. Repeated Sparking.

The second test utilized the same conditions, except they were exposed to a spark discharge. Three of the preparations which contained alcohol ignited. However, two of these substances ignited equally readily in a normal air environment. And in any case, all of these substances failed to ignite if their alcoholic content was allowed to evaporate—as it would normally within a few minutes after application.

III. The Heat Factor.

The samples were all heated slowly in an O_2 environment to a maximum of 300°C (636°F) , with no externally applied sparks. The lowest spontaneous ignition temperature was 147°C, at which point a hair dressing, still boiling, ignited. Most ignitions, including motor oil, took place close to 300°C.

IV. More Than One Atmosphere.

The twelve body compounds were exposed for one hour in an O_2 environment at four times standard atmospheric pressure, with no spontaneous ignition. When a spark was introduced, the resulting fires were extremely intense.

Conclusion.

Cosmetic or protective substances in common use contain one or more of the following: polysuccharies of plant origin; glyceride; fatty acids and alcohols; oil, grease or wax from petroleum; and silicones. The tests indicated these may safely be used in lip, face and hair preparations in the presence of 100% oxygen at pressures of one atmosphere or less. These compounds should not be present, however, in a high pressure oxygen distribution system. Static discharges may be induced from the flow of gas from such a system and from solid particles in the stream.

The four basic substances tested in this study —lanolin, vaseline (petroleum); light mineral oil, and alcohol—were considered representative of the principal constituents likely to be found in any commercial preparation for facial skin or hair.

Use of the first three basic substances was determined to be acceptably safe in the presence of 100% oxygen at pressurization of one atmosphere or less. The presence of these compounds in pure oxygen on or near a high pressure oxygen distribution system, however, is to be considered *unsafe*. Ignition is possible from static discharge in the flow of the gas, as well as from cigarettes or short circuits in mask-mounted microphones. Note that a combustible substance may remain on the hands, following application to the face or hair, which would constitute a hazard if high pressure oxygen equipment were to be handled. This is probably the most hazardous aspect of oxygen/oil spontaneous combustion.

The alcohol present in some facial preparations will normally evaporate in about one minute; therefore, the chance of igniting such a compound by static spark is considered negligible.

Normal skin oils, which are comparable in combustibility to oil in the commercial preparations, are commonly deposited on oxygen masks during use. However, the quantity of natural oil on the mask fibers is too small to contribute to ignition hazards, except in a high pressure oxygen environment.

FAA physiologists who have investigated the few documented cases of oxygen fires and explosions in aviation have been able to exclude, as a cause, the exposure of facial or hair preparations to oxygen at pressures of less than one atmosphere. On the other hand, the "burning" sensation, occasionally severe enough to lead to aborting a (military) mission, has not been satisfactorily explained. ■

Editor's Note: Reader comments suggest that our Forum discussion of this subject, although accurate, needs to be expanded. The above article is based upon "The Flammability of Lip, Face and Hair Preparations in the Presence of 100% Oxygen," a booklet which summarizes investigations carried out by FAA's Civil Aeromedical Institute at Oklahoma City, O.K. Although this publication is somewhat dated (1962) we know of no subsequent research or documented evidence which contradicts its conclusions. If readers are aware of documentable contrary evidence, we would appreciate hearing from you.

Respecting the Radome

A radome is a covering designed to protect a radar antenna from the environment. The latter is usually located in the nose or a forward compartment of an aircraft. The radome is part of the airplane and should have certain physical as well as electrical properties. It must be strong enough to withstand the air loads it may encounter, and contoured to minimize drag.

Electrically, a radome should permit the radar's transmitted signals and echoes to pass through with minimum distortion and absorption. This requires that the thickness of the radome wall be maintained precisely as required for the effective performance of the equipment. Even a slight variation in physical thickness, as might be brought about by an application of paint, or a patch, could interfere with the desired clean, non-distorted, reflection-free antenna view through the radome.

All maintenance work on the radome must be performed by or under the supervision of an FAA-qualified and appropriately experienced mechanic.

Radomes may be damaged by static discharge, which produces small pin-holes, almost invisible to the naked eye. Any hole, regardless of size, can cause major damage, since it would allow moisture to enter the radome wall and bring about delamination and fracturing.

If enough moisture collects the radar pattern will be distorted, and the transmitted signals and returns seriously attenuated.

Ram air entering through a small hole can also delaminate and break the inner surface of a radome and separate the skin from the core of the covering, which will weaken it structurally. Other types of damage include dents and scratches caused by impact with birds or debris, as well as by improper handling of the radome.

Since the accuracy and effectiveness of airborne radar can be adversely affected by the condition of the radome, this portion of the airframe deserves a careful and close examination during the pilot's preflight. In addition to spotting recent damage on the radome exterior, pilots should look for improper previous maintenance which may include:

- Patches of different thickness or material.
- Non void-free or oversize patches.
- Repairs overlapping.
- Holes stopped with resin, screws, metal, wood or plastic plugs.
- Cuts or cracks simply coated with resin.
- Metallic base coating.
- Moisture or other contaminants trapped in wall.
- Poor bonding of skin to core of covering. ■

The increasing use of airborne radar for weather avoidance has led to some concern about possible hazards on the ground when persons stand or pass directly in front of parked aircraft which may have the radar turned on for test purposes.

Through extensive evaluations FAA has determined that normal radar transmissions, at the energy level found in airborne radar equipment, do not present a risk of public injury. The agency does note (in Advisory Circular 20-68B) that there is a possibility of human body damage and/or ignition of combustible materials if the radar equipment is mishandled by unqualified persons or in a non-approved manner.

As a general rule, FAA advises that radar equipment should be handled or worked on only by personnel who are qualified to do so by virtue of appropriate training and experience.

Although there is no medical evidence of body damage from this type of radar, FAA recommends that persons should not stand closely in front of an aircraft radome, or antenna compartment. Most radomes are at approximately eye level, and eye tissue is more vulnerable to microwave emissions than other human tissue.

Maintenance personnel are advised to avoid looking into the radar waveguide, or the open end of a coaxial connector, as severe eye damage could result.

Since radar radiation is capable of heating materials it encounters, it should not be used in an area where aircraft are being fueled or defueled. Furthermore, it is considered desirable, when operating installed radar in a closed hangar, that the energy be directed toward an absorption shield.

Additional technical information contained in FAA Advisory Circular 20-68B, "Recommended Radiation Safety Precautions for Ground Operations of Airborne Weather Radar," is available from the DOT/FAA Distribution Center, M-443.2, Washington, D.C. 20590.

End of an Era A trio of PT–3's flying up a canyon near Brooks Field in west Texas is the subject of a nostalgic painting by George Grant, first place winner of the 12th Annual EAA Sport Aviation Art Contest. Consolidated PT–3's carried the basic load for primary training in the U.S. Army Air Corps from 1928 to the late 1930's.

GENERAL AVIATION STAFF ESTABLISHED IN WASHINGTON

A new "General Aviation Staff", AFS–20, has been established in FAA's Office of Flight Standards, in response to Administrator T. Allan McArtor's desire to provide better service for the general aviation community.

Headed by Wm. Michael Sacrey, a former commercial pilot from California and long term general aviation safety inspector, the staff will be the focus point of the agency for communicating the FAA mission, policies, concerns, etc. to the public; and for assuring public access to appropriate authorities within the agency. The National Accident Prevention Program and the publication, *FAA Aviation News*, have been incorporated within the staff.

AIRPORT DATA RESTORED

FAA has agreed to restore airport data to Sectional Charts within the limits of Terminal Area Chart coverage, starting with charts that were reissued on September 22, 1988. All Sectionals issued on or after that date will show airport elevation, lighting, communication frequencies and runway length, depicted in the same manner as elsewhere on the charts.

This airport information was removed from Sectionals published on or after December 17, 1987, as part of an effort to reduce clutter in the busy terminal areas. Pilot response to this change prompted the agency to seek other means of lessening clutter. The use of the larger scale terminal area charts to supplement the sectionals is strongly recommended.

LATEST FAA PUBLICATIONS

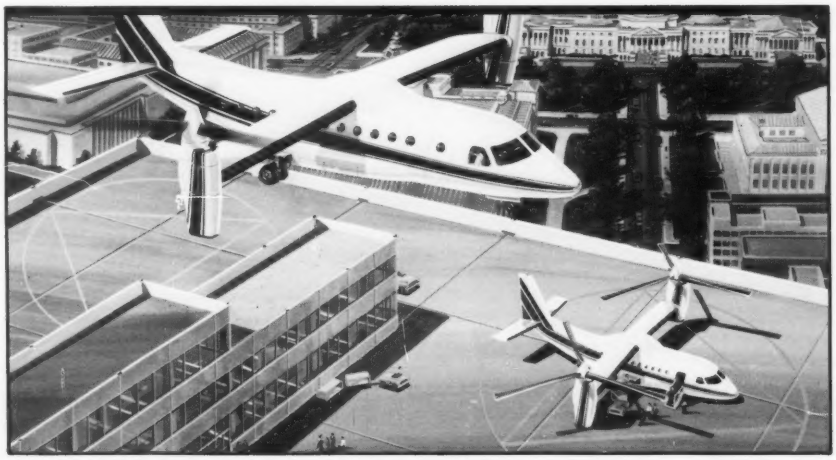
Technical Reports

The latest list of FAA scientific and technical aviation reports is now available to the public. Published during the first half of 1988, these reports cover a wide range of subjects from automated navigation to weather. To obtain the list, with titles and prices, write to FAA, Office of Public Affairs, APA–300, 800 Independence Ave., SW, Washington, DC 20591.

New FAA Directories

Advisory Circulars containing updated directories of individuals designated by FAA to carry out functions involving maintenance, airworthiness and engineering functions have been published.

- An "FAA Inspection Authorization Directory" is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.
- "A Directory of Designated Airworthines Representatives" (A.C. 183–35A) lists designated FAA representatives at maintenance, manufacturing and alteration stations. Available free from DOT M–443.2, Washington, DC 20590.
- The Directory of Designated Engineering Representatives (A.C. 183.24—IW) lists "DERs" who are authorized by FAA to approve engineering or flight test information within certain categories. Free from the above DOT address.



HYBRID HELICOPTER SOUGHT

U.S. Airbus of the future? FAA is embarking on an accelerated program to certificate a civilian version of the "tiltrotor"—a military troop carrier which would combine the vertical performance of a helicopter with the cruise speed of a conventional turboprop.

The aircraft's turbine engines at each wingtip have large, engine mounted propellers. The engine can be rotated so that the blades turn in a horizontal plane for landing, hover and takeoff, as with helicopters. For cruise-at a topspeed of 350 m.p.h.—the blades are rotated perpendicular to the wing, as with conventional airplanes. This aircraft could be the intercity commuter of the future, and could also improve our present capacity for such operations as emergency medical service, search and rescue, and drug interdiction.

• Absent Charts

I'm concerned about the non-availability of charts at many airports. I recently attempted to purchase a local TCA chart at an airport in the Washington, DC area and found the FBO's supply exhausted. This has happened to me and other pilots fairly frequently in the past.

Is there any way that the FAA can assure an adequate supply of all charts for areas near individual airports, especially those general aviation airports serving as the major points of operation near TCA's or other major air carrier airports?

Don Byers
Washington, DC

FAA has no regulatory means of ensuring an adequate supply of navigation publications at airports. Many pilots elect to subscribe directly, which assures currency. A free catalog is available from the National Ocean Service, 6501 Lafayette Ave., Riverdale, MD 20737.

• Instruction from Non-CFI's

In the letter "Riding with a Student" in the May/June 1988 issue, you responded to the question of whether a private pilot could fly in the right seat with a student pilot "... to keep him company and bolster his confidence ..." by saying that the pilot (not yet a flight instructor) must be fully qualified for and current in the aircraft and that that pilot would be pilot-in-command. I don't think your answer went far enough.

Over the years I have tried to discourage the idea of non-flight instructors giving instruction. First and foremost they are not certificated to do so. Second, most have not received any training in the educational process necessary to provide constructive and purposeful training. Third, many well-intentioned pilots have no experience in anticipating possible dangerous situations.

When my students ask if they can practice with a licensed pilot friend, I recommend that the student just ride as an observer. I explain that unless the person with them is a certificated flight instructor their time may be wasted and might even be detrimental to the learning process.

From a professional standpoint, what is the purpose of being trained for and certificated as a flight instructor, if any FAA licensed pilot could do it just as well? Please excuse the length of this letter, it is a subject near and dear to the instructor's heart.

Frank S. Phillips, Jr.
Easton, MD

We might add that there are some liability aspects for a non-CFI pilot who flies with a student pilot that bear consideration.

• Wrong CTAF Usage

The safety goals of the Common Traffic Advisory Frequency (CTAF) program are being severely compromised by the publication of UNICOM frequencies on sectional charts at airports at which the UNICOM frequency is not the CTAF, or at which there has been a change in the CTAF since the chart was last updated. Flying as I do into a number of airports at which this is the case, I use one comm radio to monitor the frequency published on the sectional and the other to listen in on the designated CTAF. I find that about one aircraft in eight is using the wrong CTAF frequency.

Recently I had a near mid-air collision at my home airport (head-on on the downwind leg). We had just switched the pattern (because of a wind change) and the opposing aircraft was flown by a pilot using a frequency that has not been our CTAF for THREE YEARS.

Deleting all frequency information at uncontrolled airports from the charts would force pilots to rely on a more appropriate source for this information, such as the Airport/Facility Directory.

Bennett E. Taber
Novato, CA

The agency is working on new symbology to simplify this information. However, the responsibility for acquiring current aeronautical information will remain with the pilot—as will the need to keep an alert lookout at all times.

It is important to understand that the frequency, shown on sectional charts at uncontrolled airports, (following the runway information) is the UNICOM frequency, which may or may not also be the CTAF. CTAF stands for common traffic advisory frequency, which is designated at airports that do not have a full-time control tower.

The CTAF provides arriving and departing pilots with a common frequency for exchanging traffic advisory information with a part-time tower, when available; a FSS, when available; or a UNICOM—in that order. The current CTAF frequency is published only in the Airport/Facility Directory, NOT on sectional charts.

CTAF use should be limited to information about aircraft that are landing or departing. UNICOM frequencies may be used for non-traffic advisory matters such as fueling or other aircraft services, ground transportation, etc.

For a complete discussion of CTAF, see FAA's Advisory Circular 90-42D, "Traffic Advisory Practices at Airports without Operating Control Towers." It is free from DOT M-443.2, Washington, DC 20590.

• ARSA Entry Terminology

Changes to the Air Traffic Control Manual (ATCM) and the Airman's Information Manual (AIM) usually agree, so that both pilots and controllers know what is going on. A recent change to the ATCM, paragraph 7–103, indicates that when a pilot calls an ARSA and receives the reply, "[Aircraft identification], standby," that two-way radio communications have been established, and the pilot can enter the ARSA. This enlightening bit of information does not appear in the most recent issue of the AIM, and I've encountered some controllers who don't know it either. Could you comment on this?

R. E. Gardner
Seattle, WA

When workload does not permit entry in the ARSA, the controller should say, "[Aircraft ID], remain outside the ARSA and standby." If he or she simply says, "[Aircraft ID] Standby," then two-way communications have been established and the pilot may enter the ARSA. If the controller uses the word "standby" without the aircraft ID, two way communication has NOT been established and ARSA entry is not permitted.

The correct phraseology will be updated in the *Airman's Information Manual*. It should be standard usage in ATC. If not, please advise the facility manager.

FAA AVIATION NEWS welcomes comments from our readers. No anonymous letters will be used, but names will be withheld on request. Address: FAA AVIATION NEWS, AFS-810, Washington, D.C. 20591.

• Geography Lesson

In the May /June 1988 article on Amelia Earhart, you mention that she "... reached Halifax, where they intended to stay the night. As it turned out they were fogbound for 14 days and nights at the Newfoundland capital before the sun shone again and they began the actual ocean crossing."

Halifax is not the capital of Newfoundland. Did the party leave from St. John's, Newfoundland or Halifax, Nova Scotia?

John R. Murphy
Indianapolis, IN

Amelia's transatlantic flight departed from Trepassey Bay, about 60 miles south of St. Johns, the capital of Newfoundland.

Thank you for the correction.

• Late IFR Arrivals

I have some difficulty with your response to the question posed in the May/June 1988 Flight Forum concerning estimated time of arrival (ETA). Your response indicated that you should use the distance from takeoff point to the airport, since you won't know your approach fixes in advance; and that ATC would protect approach airspace for 30 minutes beyond your ETA.

Don't you know your approach fix when you receive your clearance? Doesn't ATC protect airspace longer than 30 minutes in the event of radio failure? It seems to me that unexpected weather en route could change your ETA, and how could you advise ATC if your radios have failed?

William R. Martens
Bolton, CT

As indicated in FAR 91.83 (a)(6) and in FAA's Instrument Flying Handbook your flight plan indicates ETA to an airport and city, not to a fix. The actual approach will be determined by ATC in accordance with traffic conditions when you report in.

If you are unable to contact Approach Control by the time given as your ETA, Approach Control will protect the approaches at your destination for an additional 30 minutes. ATC is not required to restrict the airspace any longer than a half hour, but might do so, at the discretion of the responsible controller, under some circumstances.

If you experience radio failure during an IFR flight you would be expected to continue the flight VFR if possible, land as soon as practicable and contact ATC. If you cannot go VFR, continue to your destination in accordance with FAR 91.127, which covers radio communications failures procedures for IFR aircraft.

Note: It is virtually impossible to provide regulations and procedures for every possible situation involving communications radio failure during an IFR flight—including weather induced delays. In situations not covered by regulation the pilot would be expected to use his own best judgment.

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The Law of FOD

(Continued from p. 11)

The Cockpit

In light aircraft the majority of FOD attacks come as a result of a natural human tendency to collect things and leave them lying about. Anything left in the cockpit for more than three days can become a full-fledged FOD. The cockpit is just about an ideal hideout for this criminal element, given the abundance of concealed space and the constrictions to human mobility. As time goes by the invisible FOD population appears to breed and multiply at an incredible rate. Likewise the chances of a control being jammed in flight, a seat being disabled, a tool missing when needed, a wire being shorted out, etc. are all greatly increased.

The prevention of cockpit FOD lies in BETTER HOUSEKEEPING. We need to form an ironclad habit of putting everything in the aircraft in its place and getting rid of everything we have no place for. This includes such common items as:

- sunglasses, binoculars, flashlights
- pens, pencils, portable calculators
- notebooks, charts, flight publications
- screwdrivers, pliers, can openers
- cameras, film, tripods
- hats, jackets, raincoats, etc.

All of the above are useful articles to be sure, but all have also been FOD offenders at some time and place. Any metallic objects left on the panel top can cause a compass error, for example. Narrow, round items are great at slipping in between hinged components. Small rectangular boxes love to crouch behind rudder bars. Loose papers can jam up seat tracks or doorways.

Just glancing around the cockpit as the aircraft stands at rest may not give you the true picture of the potential hazards. You have to imagine yourself flying in the worst possible turbulence with the aircraft flung 90° to the horizon and pitching like a bucking bronco. Under these conditions the important navigation publications at your elbow can be whisked out of sight; the coffee thermos on a seat can be transformed into a missile; and any loose items on the floor can be swept about like shells on a stormy beach and ultimately disappear. If you encounter severe turbulence you are going to be far too busy flying the airplane to cope with FOD.

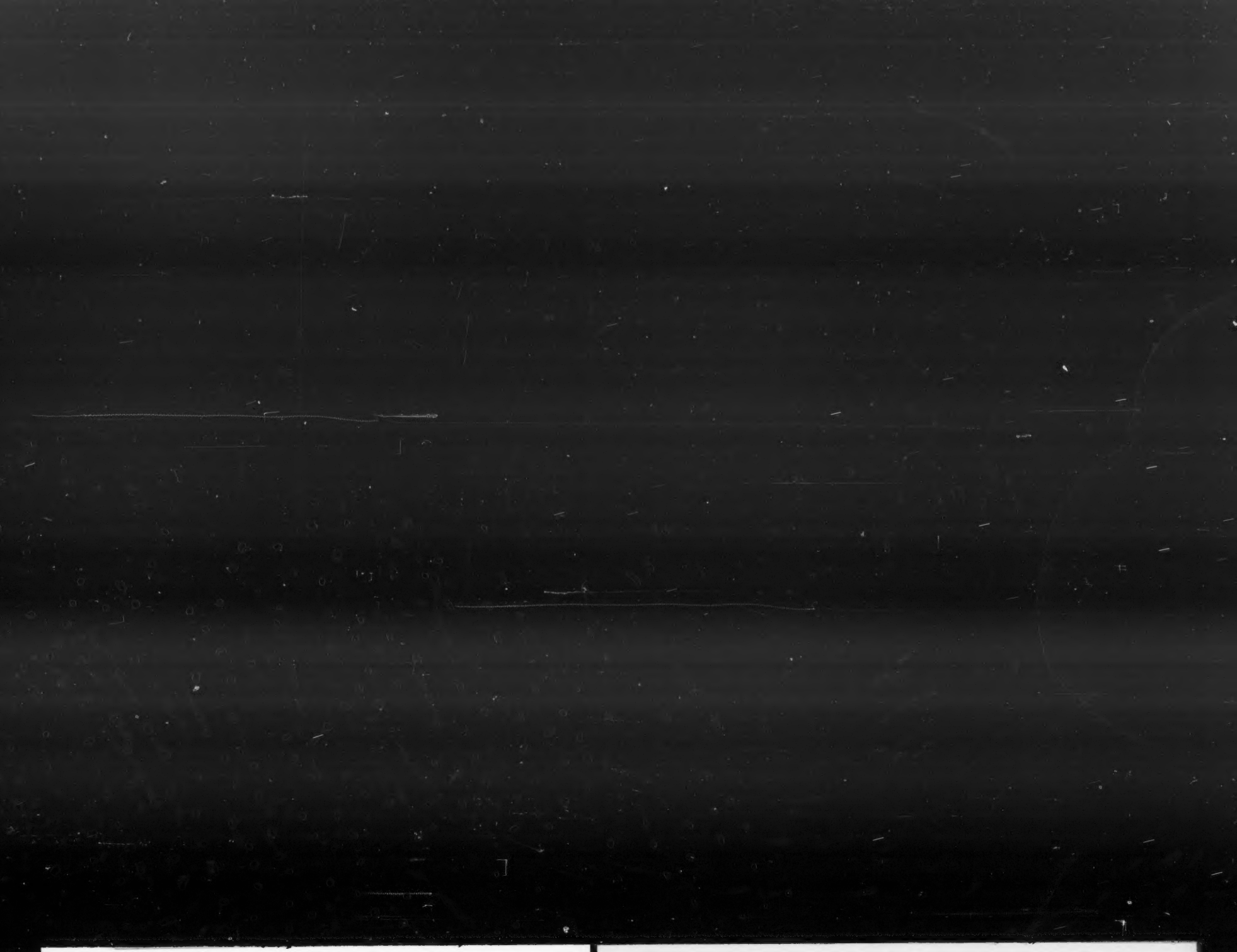
The airman's best defense against the irrevocable Law of FOD is a stern oath: *Nothing is to be left in the aircraft at take-off unless it is enclosed in a compartment or strapped down.* Whatever has to be within arm's reach—pens, navigation material, owner's manual and the like—should be on your person, in the glove compartment or in a seatback pocket. Everything else is baggage, and belongs in the baggage compartment.

In short, Stow it or Throw it.

AIRCRAFT HOUSEKEEPING HINTS

1. Wear shirts or jackets with pockets that fasten closed. Unconfined FODs relish an opportunity to slip out when you are bending over, or crawling around, in or under the aircraft.

2. Use a zippered kit bag for your tools. Items like screwdrivers or wrenches were not designed to fit into pockets.

3. Do not store solid materials underneath a seat, if you care about your vertebrae. Airplane seats are designed to absorb energy (and protect the occupant) by compressing downward in the event of vertical deceleration). Any object which interferes with this compression will lessen that protection.

4. Rental aircraft offered you should be clean and tidy—insist on it. And be conscientious about returning the aircraft in that condition. The pilot to whom you are doing a favor might be yourself.